the first aircraft to journey from the Old World to the New and back again, and we extend our heartiest congratulations to Major Scott and his crew on the unqualified success of their remarkable flight.

NOTES.

ON July 11—the eve of his seventieth birthday—Sir William Osler, Regius professor of medicine in the University of Oxford, was presented with a collection of essays contributed by representative members of the profession on both sides of the Atlantic—physicians, surgeons, physiologists, anatomists, pathologists, and historians—to the number of one hundred and fifty. The presentation was made before a large audience at the house of the Royal Society of Medicine by Sir Clifford Allbutt, Regius professor of physic in the University of Cambridge, who said that though the last years had been a time of war and desolation, yet through the clamour and destruction Sir William Osler's voice among the voices in the serener air of faith and truth had not failed; nor had he grown weary in labouring for the sufferings of others. In Sir William Osler was to be seen the fruitfulness of the marriage of science and letters and the long inheritance of a culture which, amid the manifold forms of life, had survived to inspire and adorn a civilisation which so lately had narrowly escaped the fury of the barbarian. Sir William Osler, in reply, said that two circumstances deepened the pride he felt at this demonstration of affection by his colleagues on both sides of the Atlantic; one, that amid so much mental and physical tribulation his friends should have had the courage to undertake this heavy two-volume task, and the other that this honour was received at the hands of his brother Regius professor, a friend of more than forty years. He had deeply appreciated the loyal support of the large circle of men with whom his contact had been through the written word, the general practitioners of the English-speaking world. A vote of thanks to Sir Clifford Allbutt, moved by Sir D'Arcy Power and seconded by Sir Donald MacAlister, was carried by acclamation. The volumes have not yet been issued to the subscribers, and subscriptions may still be sent to the English publishers, H. K. Lewis and Co., 136 Gower Street, W.C.1.

BY the death of Sir John Brunner on July 1 the world has lost, not only a great industrial leader, but also a man famed for his wide sympathy with, and his practical support of, national schemes for the improvement of the conditions of labour, no less than for the development of scientific education and research. It is no small thing in this country that a man of wealth should endow the university of his native city with three professorial chairs in physical chemistry, in economic science, and in Egyptology. Born at Everton in 1842, Sir John Brunner was trained in the Unitarian school which his father, son of a Protestant minister at Zurich, had opened in Liverpool. At fifteen he began his business career in a shipping office, and at twenty entered the chemical works of Messrs. Hutchinson and Earle at Widnes. Here he began that association with Dr. Ludwig Mond which was destined to revolutionise the alkali industry. Convinced of the economic advantages of the Solvay system, the two joined forces and started making soda by the ammonia-soda process in 1873 at Winnington, Cheshire. How "Brunner, Mond's" overcame its first difficulties owing to the business capacity and the chemical genius of the partners, and how the firm absorbed neighbouring works at Lostock-Gralam, Middlewich, and Sandbach, which, adding their output to that of their ever-growing parent at Winnington, gradually made it the largest in the world, makes one of the romances of industrial science. If before the war Sir John Brunner preached reduction of armaments at home and a friendly understanding with Germany abroad—and his critics have not failed to remind the world of the fact—it is fair to record that *in the war* no firm was in a finer position to turn its magnificent resources to the supply of high explosives, and no firm made a more wonderful or more successful effort to do so than the firm founded by Sir John Brunner.

THE Civil List pensions granted during the year ended March 31 last, under the provisions of the Civil List Act, 1910, includes the following:—Mrs. Edith Harrison, in consideration of the services rendered by her late husband, Col. W. S. Harrison, in connection with inoculation against enteric and typhoid fevers, 50*l.*; Mrs. Cash, in view of the contributions of her late husband, George Cash, to the study of Scottish topography, 50*l.*; Mr. William Cole, in view of his contributions to the study of natural history and to scientific education, 50*l.*; Mrs. R. O. Cunningham, in view of the services of her late husband, Prof. Cunningham, as naturalist on board H.M.S. *Nassau* during the survey of the Straits of Magellan and the west coast of Patagonia, and as professor of natural history in Queen's College, Belfast, 50*l.*; Mr. Benjamin Harrison, in view of his devotion to scientific work (in addition to his pension of 26*l.* a year), 25*l.*; Mrs. E. A. Mettam, in view of the distinction of her late husband, Prof. A. E. Mettam, as professor of pathology and bacteriology, and of his contributions to veterinary science, 75*l.*; Miss Helen Tichborne, in view of the late Prof. Tichborne's scientific discoveries in chemistry and pharmacology, 60*l.*; Miss Eliza Standerwick Gregory, in view of her eminent services to botanical science, 60*l.*; and Lady Eleanor Charlotte Turner, in view of her late husband, Sir George Turner's services in the investigation and prevention of rinderpest, and in consideration of his death through contracting leprosy in the public service, 50*l.*

THE Ministry of Ways and Communications Bill was read a third time in the House of Commons on July 10. Sir Eric Geddes, the Minister-Designate, announced the names of the prospective heads of departments as follows:—*Civil Engineering:* Sir Alexander Gibb, Civil Engineer-in-Chief, Admiralty, 1918. *Mechanical Engineering:* Lt.-Col. L. Simpson, R.E., Chief Mechanical Engineer in Charge of Railway Equipment and Rolling-stock of the British Armies in France. *Consultant Mechanical Engineer:* Sir John Aspinall, president of the Institution of Civil Engineers. *Traffic Department:* Sir Philip Nash, K.C.M.G. *Finance and Statistics:* Sir J. George Beharrell. *Development Department:* Rear-Admiral Sir Charles Martin de Bartolome, K.C.M.G. *Public Safety and Labour:* Sir William Marwood, K.C.B., Joint Permanent Secretary of the Board of Trade. *Roads Department:* Brig.-Gen. Sir Henry P. Maybury, K.C.M.G. *Secretarial and Legal:* Sir R. Francis Dunnell, K.C.B.

CAPT. H. J. PAGE has taken up the appointment of research chemist and head of the chemical department of the Research Station and School of Horticulture of the Royal Horticultural Society at Wisley, Surrey, on his release from military service. Capt. Page is an 1851 Exhibition research scholar of University College, London, and was formerly on the staff there.

THE Joint Committee of the Board of Agriculture and Fisheries and the Road Board appointed to consider the question of alleged damage to fisheries from the washings of tar-treated roads has selected Mr. A. J. Mason-Jones as biologist and observer to assist with experiments, which will be commenced in the near future. Mr. Mason-Jones has had a distinguished academic career and considerable experience as naturalist on the staff of the Marine Biological Association. He has recently been engaged in a study of the biological conditions of fresh-water streams.

THE third annual meeting of the Association of British Chemical Manufacturers was held on July 10. The chairman, Mr. R. G. Perry, reported a membership of 145 firms, representing a capital of about 70,000,000*l*. In addition, seven kindred associations are affiliated to the association. During the year much useful work has been accomplished in consolidating the industry and strengthening the position of its various branches. The chairman pointed out that we are only on the threshold of a great dye industry in this country, and the council of the association has paid close attention to this question. A strong commission of the association, representative of all branches of the industry, has recently returned from, and reported comprehensively upon, its visit, under Government auspices, to the chemical factories in the occupied area of Germany. Chemical industry has derived great benefit from the activities of the association since its formation in 1916.

THE death of Mr. Albert Vickers, formerly chairman of Vickers, Ltd., occurred at Eastbourne on Saturday last. Mr. Vickers resigned his chairmanship last September on attaining his eightieth birthday. He was born in Sheffield, and entered his father's business in 1854. After a few years in the United States he returned to this country, and took charge of the commercial side of the business. The success with which the firm has met the enormous demands made upon it during the war is striking testimony to the soundness of the policy pursued by Mr. Vickers. The construction of guns began with the introduction of Mr. (afterwards Sir Hiram) Maxim in 1883, and orders for large guns were secured from the Admiralty in 1888, as well as orders for armour-plate. A further development took place in the direction of enabling the firm to carry out the complete construction of products, *e.g.* battleships, instead of furnishing steel, etc., to other constructional firms for this purpose. The Naval Constructional Works at Barrow-in-Furness were absorbed in 1896, and the Maxim-Nordenfelt Works in 1897. Others followed until the company became independent of outside supplies, and the capital increased from 155,000*l.* to more than eight millions sterling, and the workers from 1000 to more than 100,000.

WE are glad to note that the publication of the *Quarterly Journal of Experimental Physiology* has been resumed after suspension during the past year. The editors announce that it is intended that the journal shall now again appear regularly. Of the eight papers in the present issue (vol. xii., No. 2, May, 1919) we have space to note only certain conclusions in one. Prof. P. T. Herring finds that the suprarenals of the young adult female white rat are normally some 40 per cent. heavier than the suprarenals of male animals of the same body-weight, and that the adrenalin content of the suprarenals of the female white rat is rather more than twice that of the suprarenals of the male animal of the same size. The larger suprarenals and adrenalin content of the female white rat are associated with sex differences in the other endocrine glands and organs of the body (*e.g.* thyroid and pituitary).

CRAWLING medusæ, or jellyfish, with their tentacles modified to form what may fairly be called legs, have long been known, but they are rarely met with, and the discovery of a new species at the Cape of Good Hope is a matter of considerable interest to zoologists. Dr. J. D. F. Gilchrist describes this species under the name *Cnidonema capensis* (*Quarterly Journal of Microscopical Science,* vol. lxiii., part 4), instituting a new genus for its reception, and associating with it generically four other southern species previously known. The medusa, which first appeared in a tank at the Marine Laboratory near Cape Town, is very small, usually less than 1 mm. in diameter. Its numerous tentacles divide, as usual in the crawling medusæ, into two branches, one of which is modified for "walking," while the other is provided with batteries of thread-cells and curves over the back of the animal. It is produced by budding from a small hydroid form, with a verticil of three capitate tentacles around the mouth, and a second verticil of six non-capitate tentacles lower down, which was also found in the aquarium.

MR. J. RUNNSTRÖM has made at Monaco and at Bergen some very careful observations on the movements and physiology of sea-urchin larvæ, now published in Bergens Museums Aarbok, 1917–18. Locomotion is generally in spirals or in large curves, accompanied by a revolution of the larva, so that the course reminds one of the moon's orbit. This is effected by the cilia, chiefly of the processes and epaulettes, but also of the general body-covering, and the curves are due to greater intensity of action on one side or the other. The direction of motion is affected by light, and by chemical or other stimuli. The course of the ciliary currents which convey food to the mouth is also studied, and they are found to have some selective power, not, however, free from error. The food-particles when they reach the œsophagus are retained by a slimy secretion, and are carried further by ciliary currents, the course of which is described. In his remarks on the action of the larval water-vascular system, Mr. Runnström mentions that the hydropore is at first on the left, but closes, and a new hydropore opens on the median line. There are many other points in this detailed study which should be of interest to general physiologists as well as to students of Echinoderms.

TWO areas in the forest-lands of eastern Canada, easily accessible from the growing cities to the south, have been recently described by the Geological Survey of Canada. In Memoir 95 Mr. W. H. Collins deals with the Onaping map-area, and describes some interesting rocks from the pre-Huronian schist-complex, including what he believes to be the first discovery of variolite in Canada. He refers the cliff-bordered linear valleys of the district to faulting, and Mr. M. E. Wilson, in Memoir 103, on Timiskaming County, Quebec, comes to the same conclusion. These valleys are pre-Glacial, and are probably due to a Pliocene uplift. It may be remarked that similar valleys of recent origin in Finland are also ascribed to earth-movement acting on the hard pre-Cambrian rocks. The cliffs are thus uneroded fault-scarps. On both shores of Lake Timiskaming the passage from the Lorrain granite to a quartzite of the Cobalt series, through an arkose that represents the soil-surface of early Huronian times, is an interesting feature of the region; exploration is as yet practically confined to the waterways. The first hint of the mineral wealth of Canada was given when the veins of galena on the lake-side at Anse de la Mine were indicated on a map published in 1744.

PERSIA'S mineral wealth is great, but the greatest yet discovered is mineral oil, the exploitation of which will shortly be commenced (*Allgemeine Oesterreichische*

Chemiker- und Techniker-Zeitung, December 1, 1918). Deposits of unknown value underlie the extensive oil-field of the Irak districts. Trial borings have shown an oil-bearing tract of more than 1000 sq. km., apparently capable of yielding a larger output of oil than the Baku wells, and of better quality. The northern limits of the oil zone lie in the province of Kermanshah; to the east it reaches to near Ispahan, runs diagonally across Arabistan, continues along the border hills of Dashti and Dashtistan behind Bushehr, the most important of the Gulf ports, and ends in the neighbourhood of Banda-Abbas, the terminus of the great caravan-route, Meshed-Kirman. Borings made in 1890 proved the existence of rich oil deposits in the Island of Kishem, off the coast. Since that date great progress has been made in developing the industry. Persian oil is said to be superior to the American; it contains a large percentage of benzene and kerosene.

A WRITER in *Zeitschrift für Instrumentenkunde* (November, 1918) describes a series of tests made on a Benedick galvanometer of the differential type to determine the cause of variations in its zero reading. The instrument is of the d'Arsonval type, the moving coil being suspended by a quartz fibre and the current led in and out by four thin metal ligaments. Tests show that the sensitiveness depends on the curvature of the pole-faces, and an analysis of the results with the aid of the equations of motion of the movement shows that the change is due to an alteration in the restoring force. As the suspension was unaltered during the test, it follows that the effect is due to magnetic action. This action is caused by the presence of traces of iron in the copper winding. This assumption is borne out by tests, which are described, showing the change in sensitiveness due to varying the position of the moving coil in the field. There is an after-effect causing a permanent motion of the zero of the instrument in the direction of the last deflection.

A PAPER by Messrs. F. B. Silsbee and R. K. Honaman, of the United States Bureau of Standards, which appears in the Journal of the Washington Academy for May 4, summarises the results of their work during the last two years on the relative merits of the various insulating materials used in sparking-plugs. Cup-shaped vessels of the materials were tested between 200° and 900° C. in an electric furnace, the resistivity being determined from the fall of potential between the molten solder inside and that outside when a measured current passed through the cup. Measurements with direct currents were found to be useless owing to the polarisation produced, but with alternating currents of 60 cycles per second the results for the same specimen were always consistent. At 500° C. the resistivities of a few typical materials in megohms per cm. cube are:—Fused silica 340, best porcelain 80, typical mica 70, aeroplane plug porcelain 40, motor-car plug porcelain 0·8. A minute quantity of impurity in the material appears to reduce the resistivity considerably. The change of resistivity with temperature is given by $\log_{10} R = c - bT$, where R is the resistivity, c is a constant between 10 and 12, and b a constant between 0·0065 and 0·0085.

IN the science reports of the Tohoku Imperial University, vol. vii., No. 3, there is an account by Murakami of an investigation of the structure of ferro-carbon-chromium alloys. By utilising methods of magnetic analysis and microscopic examination, alloys containing less than 6 per cent. of carbon have been systematically investigated, and a structural and constitutional diagram of their normal states has been obtained. The author confirms the existence of a compound Cr_4C, having a hexagonal crystalline form as put forward by Moissan. The influence of this carbide on the A_1 change in steels has been investigated. Above this point the carbide dissolves in austenite, and, on heating to a high temperature, it dissociates as follows:—

$$2Cr_4C = Cr_3C_2 + 5Cr.$$

During cooling the reverse change takes place only slowly, and this influences the position of the transformation point. On one hand, if the rate of cooling is sufficiently slow, the change occurs at about 700° C.; while on the other, if it is quick, the transformation point is very conspicuously lowered, and in extreme cases completely suppressed. A specimen having a normal transformation point shows a pearlitic or troostitic structure, one having a lowered transformation point a martensitic structure, and when the transformation is suppressed an austenitic structure. The self-hardening of a chromium steel is related to the lowering, or, in extreme cases, the suppression, of the A_1 transformation, and hardness is caused by the solid solution of the carbide Cr_3C_2 in iron and chromium. The author has come to the conclusion that there are three ternary compounds, namely, α, β, and γ double carbides. The micrographic and magnetic characteristics of these compounds have been investigated by him.

THE results of some interesting tests on locomotive piston-valve leakage are given in *Engineering* for July 4. The tests were conducted by the test department of the Pennsylvania Railroad at Altoona, and have extended over several years; a specially arranged testing plant was employed. The results were erratic, and the following abstract of some of the results takes account only of all that appeared normal. With a standard two-ring valve, 12 in. in diameter, in plain bushing, the leakage at each end of the valve ranges between 171 lb. and 183 lb. per hour with saturated steam; between 194 lb. and 210 lb. with steam at 100° superheat; between 181 lb. and 197 lb. with steam at 200° superheat; and between 122 lb. and 132 lb. with steam at 300° superheat. For the bushing with ports a leakage between 302 lb. and 326 lb. per hour occurred with saturated steam; between 425 lb. and 448 lb. per hour for 100° superheat; and between 383 lb. and 414 lb. per hour for 200° superheat. The length of valve-travel, when it ranged between 2 in. and 6 in., was found to have but little effect upon leakage. The speed of the valve (strokes per minute) had no appreciable effect upon leakage. As much as 15 h.p. was required to drive the valve in tests at 300 revs. per minute.

Messrs. George Allen and Unwin, Ltd., have in preparation "Defective Housing and the Growth of Children," by Dr. J. L. Dick. Three lectures recently delivered before the University of Cambridge are announced for publication by the *Cambridge University Press*. They are "Science and War" (the Rede lecture), by Lord Moulton; "Italian Studies: Their Place in Modern Education," by Prof. T. Okey; and the Leslie Stephen lecture on Pope, by Dr. J. W. Mackail. The same publishers also promise a revised edition of Dr. A. Harker's "Petrology for Students." *Messrs. Longmans and Co.* announce for publication in the autumn a new book, limited to 105 copies, by A. Thorburn, entitled "A Naturalist's Sketch-Book," containing 60 plates, 24 in colour and 36 in collotype. It will form a companion volume to the same author's "British Birds." Among other books in the press for appearance by Messrs. Longmans we notice "An Introduction to General Physiology," Prof. W. M. Bayliss; "The Principles of Child Physiology, Pure and Applied," Dr. W. M. Feldman; "The Physiology of Muscular Exercise," Prof. F. A. Bainbridge; "Cement," B. Blount; "Applied Aerodynamics," L. Bairstow; "Aeroplane Structures," A. J. S. Pippard and Capt. J. L. Pritchard; "The Design of Propellers for Aircraft," H. C. Watts; "Telephonic Transmission, Theoretical and Applied," J. G. Hill; "Principles and Practice of Electrical Testing as applied to Apparatus, Circuits, and Machines," R. G. Allen; "Engineering Machine Tools and Processes," A. G. Robson; and "Efficient Boiler Management," C. F. Wade.

ERRATUM.—We regret that in the article on "Some Recent Atomic Weight Determinations" in NATURE for July 3, p. 346, the name of Prof. T. W. Richards was incorrectly given as "Theodore Williams," the surname being omitted.

OUR ASTRONOMICAL COLUMN.

THE MOVEMENT OF THE EARTH'S POLE.—The issue of *Scientia* for July contains an article by the Astronomer Royal on this subject, which comprises a concise statement of the movement predicted by Euler, and of suggestions that have been made to show why the observed movement does not conform to this. The Eulerian principle enunciates that the axis round which the earth would turn, assuming it to be a rigid body set spinning about an axis other than the axis of figure, would always point in the same direction in space (*i.e.* among the stars) within a very little, but would describe a cone in the earth in a period of 305 days, the radius of the circle described by the wandering pole being about 10 metres. Observations show that the movement is compounded of two circular motions of periods of a year and of 432 days respectively. Sir Frank Dyson writes that the dynamical causes underlying these movements are probably to be found in the changes of distribution of matter on the earth, and quotes Newcomb, who thought the amplitude of the Eulerian movement was increased or diminished irregularly by meteorological changes. Mr. Harold Jeffreys has lately shown that a shift of matter symmetrical about the earth's axis will not have any effect in shifting the earth's axis of rotation, and looks for the cause in an unsymmetrical increase of mass, such as is caused by the high barometer over Siberia in the winter, which, however, is not sufficient of itself to produce the observed effect. The lengthening of the free Eulerian period from 305 days, on the assumption of a rigid earth, to 432 days supplies information as to the possible amount of elasticity of the earth.

THE MASSES OF BINARY STARS.—There is a well-known formula by which the total mass of a binary system can be found if the parallax is known, as well as the elements of the orbit. The modern method of deducing stellar parallax by examination of the spectrum therefore provides much data for determination of mass, and Prof. Aitken, of Lick Observatory, has lately (Pub. Ast. Soc. Pac., June) used the parallax of twelve binaries taken from Messrs. Adams and Joy's list to find their masses. These had been already found by help of the trigonometric parallax, and though considerable discordance was shown for individual systems, the agreement of the mean mass of the twelve binaries, which was 1·61 times that of the sun by the one method and 1·67 times by the other, showed that the new parallaxes might be considered trustworthy for mean results. Prof. Aitken, therefore, determined the mass of seven other stars which are common to the list above cited and his own list of binary systems. These, with Sirius and α Centauri and the twelve before mentioned, make a list of twenty-one systems the mass of which is known. They range from 0·21 to 7·21 times that of the sun, the mean value being 1·88; and though some of the individual mass-values must still be regarded as uncertain, the mean result may be taken as confirmatory evidence that the short-period visual binary systems near to us are about twice as massive as our sun. It may be noted that five stars of classes K and M are, on the average, only half as massive as the sixteen stars of classes A to G, and are, on the average, nearly four magnitudes (absolute) fainter.

SCIENCE IN INDUSTRY.

LECTURES AT THE BRITISH SCIENTIFIC PRODUCTS EXHIBITION.

SIR WILLIAM TILDEN, in his lecture on "Chemistry in Reconstruction" at the British Scientific Products Exhibition on July 7, remarked that a visitor to the exhibition could not fail to experience the comforting conviction that British chemical manufacturers are now quite capable of holding their own in regard to quality and variety of products. They will undoubtedly be able to supply the wants of this country if they continue to exhibit the same skill, energy, and resource which have been gradually developed during the last five years, and to be protected for a time from foreign imports. With regard to trade outside the United Kingdom, it is too soon to indulge freely in optimism. The Prime Minister, in his recent speech in the House of Commons on the Peace Treaty, pointed to the condition of German territory, which has not been damaged or disturbed to any appreciable extent by the operations of the war, and still retains the famous chemical establishments with plant and machinery in working order, and even increased in power by the material stolen from Belgian and French factories. Moreover, Germany has the services of a very large body of technical chemists of great skill and experience. Germany will, naturally, make greater efforts than ever to penetrate into foreign markets. Then there is Switzerland, with good schools of chemistry and an already established chemical industry. The United States of America during recent years has vastly extended the chemical departments of its universities and technical schools, and devoted huge sums to the development of chemical manufactures. Japan also with a well-equipped university and many natural products, combined with cheap labour, will certainly appear in the field.

All these will undoubtedly prove very formidable competitors in the race in which the British chemist will have to enter. In this country also there is still a great deficiency in the number of well-qualified chemists available for the service of industry. The manufacturer has too long been satisfied with the services of the laboratory boy, who can be taught to perform routine testing without any knowledge of more than the most elementary chemical principles. We require a large number of well-educated men equipped with the fullest possible knowledge of modern chemistry in every branch. Lord Crewe referred at the opening of the exhibition to the several methods which have been so far employed for converting the academic into the industrial chemist. There can be little doubt that this is best accomplished in the works, and in the long run manufacturers will find it pay best to employ the academic chemist thoroughly drilled in the practice of analysis and well acquainted with all the methods of research, who must be assumed also to possess common sense, and give him facilities for gaining that knowledge of constructive materials and elementary engineering which is requisite for his work.

The exhibition contains a most instructive and